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CHILDREN'S USE OF COST-BENEFIT ANALYSIS:

DEVELOPMENTAL OR NON-EXISTENT

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July 1985

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ABSTRACT

The main purpose of the study was to ascertain whether the use of cost-benefit analysis by children tends to be age-related, a function of instructional mediation, both, or neither. The subjects included 220 first, second, third, and fourth graders ranging in age from six to nine years old. One hundred and fourteen subjects were assigned to the treatment group. All subjects lived in a predominantly white neighborhood and attended one of two neighboring schools. Each subject was individually interviewed; responses were tape recorded and later scored by two trained judges who were specialists in economics.

The major results indicated that children, as they get older seem to have both a better understanding of cost-benefit analysis and a tendency to invoke such reasoning in everyday decision making. Also participation in an instructional program, Mini-Society, appears to produce both a greater understanding of and proclivity to utilize cost-benefit analysis.

INTRODUCTION

That economic literacy is an important goal has been recognized in the United States and throughout the world (Kourilsky, 1983). Stigler (1970) stated "I would argue that economics belongs in everyone's education once we have learned how to teach it." (p.81) To date, twenty-seven states have mandated the teaching of economics in some form in secondary, or in some cases, elementary schools. The question remains, do we know how to teach it?

Even kindergarten children can learn economic decision-making and analytic concepts, provided that standards of appropriate concentration and focus are met (Kourilsky, 1977; Robinson, 1963). The same was found true for children in subsequent grades (Luker, 1981; Walstad, 1980; Ritt, 1969; Jefferds, 1966). However, to what extent are they able to master principles of economics? When are they developmentally ready to be introduced to specific economic concepts? Finally, can we make a case that because economics <u>can</u> be learned at a particular grade level, it necessarily <u>should</u> be taught? To answer the above questions we need greater communication and perhaps a professional liason between two disciplines--economics and psychology. For example, it is a widely held belief among developmental psychologists that youngsters both at the pre-operational and concrete stages (Piaget, 1952) are unable to master and apply such economic concepts as cost-benefit analysis. It is alleged that the pre-adolescent has little sense of the costs to some that follow from the benefits to others (Adelson, 1975). Some economists, on the other hand, have empirically demonstrated that young children do not find the concept of cost-benefit analysis beyond their grasp if "proper" instructional techniques are employed* (Luker, 1981; Walstad, 1980; Kourilsky, 1977; Fogel, 1976; Ryan and Carlson, 1973). A case could be made for teaching a particular economic

*Cost-Benefit Analysis: A process of making a decision by evaluating different options in terms of benefits foregone versus benefits anticipated.

concept at a designated grade if either (1) the individual would be personally benefited by enabling him or her to transfer (from a test-situation) the concept to personal decision-making and/or (2) society would be benefited by enhancing the individual's ability to vote rationally or otherwise contribute usefully to social decision-making (Mourilsky, 1983).

The economist would benefit greatly from approaching the question of what to teach and when to intervene by knowledge and application of developmental psychology, whereas the developmental psychologist would benefit from information on what kind of teaching results in outcomes previously believed to be developmentally inappropriate for youngsters.

This study addresses the three following questions in the above areas of interest:

(1) Is economic cognition (the understanding of cost-benefit analysis) greater for those children exposed to instructional intervention--The Mini-Society--than among those who receive "regular" social studies instruction?

(2) Is the proclivity to use economic reasoning in daily decision-making, both with respect to monetary decisions and time-allocation decisions, greater for children exposed to the treatment--The Mini-Society--than for those who were not exposed to the treatment?

(3) Are understanding of cost-benefit analysis and/or the proclivity to use economic reasoning in daily decision-making age-related?

The Ranking of Economic Decisions

Economic reasoning can be conceptualized in terms of a cost-benefit decision-making hierarchy that integrates scarcity, alternatives, and opportunity

cost (Kourilsky and Murray, 1981). .At Level 1 of the hierarchy, the student will have identified scarcity as a relevant decision-making issue and will have explicitly or tacitly specified scarce resources. For example, in deciding whether to buy a German shepherd puppy, Level 1 thinking is reflected in such statements as "Dogs cost a lot of money," "I'm not a millionaire," "Who is going to walk and bathe the dog?"

At Level 2, specific alternative uses for the identified resources are acknowledged, i.e., particular benefits or opportunities are recognized. The following statements are examples of Level 2 thinking: "The money to buy the German shepherd puppy could be used to buy a bike, a pair of skis, a Lhasa Apso dog, two weeks at sports camp, and lots of other things."

At Level 3, the individual is able to identify those alternative uses (for resources) that are realistically within his/her consideration set and then rank them in terms of the anticipated benefits of each. The following represents Level 3 reasoning: "I would really rather spend two weeks at sports camp this summer than buy a dog. I don't think the fun of having a dog is worth giving up the time away from my homework to walk it each day. I'm having a hard enough time getting a C in arithmetic now; besides, I'm pitcher on the Little League baseball team, and we practice on Saturdays. I'd hate not being able to play baseball on Saturday, but that's the only time I'd have to wash the dog. Maybe I'll buy a dog next year."*

The use of economic reasoning in decision-making is not necessarily the only or the "best" paradigm for problem-solving. However, previous research has shown that individuals and families utilizing economic reasoning in their daily decision-making gain increased satisfaction (Kourilsky and Murray, 1981).

*Note that at Level 2 students can explicitly identify competing "opportunities" but do not explicitly "weigh" the alternatives.

METHODOLOGY

Participants

The participants included 220 first, second, third, and fourth graders ranging in age from six to nine years old (53 first graders, 59 second graders, 55 third graders, and 53 fourth graders). One hundred and fourteen participants were assigned to the treatment group and 106 to the control group. All participants lived in an upper middle class predominantly white neighborhood and attended one of two neighboring schools. These schools were selected because (1) all youngsters participate in the treatment--The Mini-Society--only once in either the first, second, third, or fourth grade, and (2) one social studies teacher implements a Mini-Society class and a "regular" social studies class at each of the four grade levels. Student assignment to Mini-Society classes is on a random basis.

The Treatment: The Mini-Society

Mini-Society is an economics-oriented/experience-based program in social studies designed for elementary school pupils (Kourilsky, 1983, 1974). The system is based on three principles which suggest that learning is enhanced when it involves (1) active as opposed to passive participation, (2) real as opposed to vicarious experiences, and (3) actual decision-making in which the learners bear the consequences of their decisions.

In Mini-Society, students create their own microcosmic version of an adult economy. In the creation and development of their classroom society, students necessarily experience and then resolve various economic and social problems like those encountered by any society. However, experiencing dilemmas is only one of two interwoven components of the system; the second, the formal debriefing

of concepts and ideas derived from the experience, is as essential as the experience itself.

The system is generated when the teacher activates scarcity situations that are inherently motivating (e.g. "not enough felt-tip pens, classroom chairs, or spaces on a field trip, to go around"). Scarcity is the universal problem that provides the impetus for the formation of any economy. Having experienced scarcity, children are assembled into a debriefing group where the teacher helps them focus on the dilemma and derive possible resolutions to their problem. The children's resolutions are often similar to those utilized in adult economies.

At least 82% of the children eventually attempt a price mechanism to allocate the scarce resources. They design and print currency with which they bid for the scarce resources and determine who may purchase them. The debriefing group continues to serve as a "town meeting" where students resolve other problems and make various societal decisions.

As the Mini-Society continues, children find various ways of earning money to provide the desired purchasing power. Some become entrepreneurs, selling goods such as wallets, or services such as needlepoint lessons. Others choose to become salaried workers, either in the society's private sector, or in civil-service positions identified and demanded by the society's membership.

As the daily business and societal activities continue to expand, Mini-Society citizens are faced with a number of predictable dilemmas which their teachers are specifically trained to debrief. In formal debriefing sessions, the children's actual experiences become the foci of inquiry lessons on relevant concepts ranging from distribution of wealth and charity versus compensation to economic shortages and sunk costs.

As students experience social, political and economic problems, explore

various resolutions and their implications, and implement as well as bear the consequences of their resolutions, they are operating in a society which to them is the real world.

Tests

To test the students' economic cognition a "true-false justify your answer" questionnaire was read to each subject on an individual basis. Their responses were tape recorded. Each of the five questions was aimed at levels of cognition beyond recall, including both simple and complex application questions. Scores ranged from 0 to 10 points with each response worth 2 points. This economic cognition instrument developed by M. Kourilsky and J.F. Barron in 1965 has an alpha coefficient (Cronbach) of .882, indicating a high degree of internal consistency.

Each answer was scored separately by two trained judges (not the experimenter), both specialists in economics, who were unaware of whether the subjects were treatment or non-treatment. Using the Pearson product-moment correlation, the interscorer consistency of the two judges was established at .946.

A sample question and example of scoring is as follows:

Paying $500 for a package of M & M candies would be paying a very high price.

Examples of possible responses and scores are as follows:

0 = "yes" or "no", with no additional, or with incorrect information forthcoming after prompting.
1 = "yes--it costs me a lot. Five hundred dollars is a lot of money." The response shows some knowledge of opportunity cost.
2 = "yes--it costs me a lot. I could get the best bike in the world for that much money, and that's worth more than a package of candy." A reason is given; the alternative foregone is explicated.

The economic test was administered in an interview to control for differences in subjects' reading ability, to diminish the possible threat of

a test-like situation, and to allow young subjects the leeway to express complex ideas without being constrained by their limited writing abilities.

Skill in economic reasoning with respect to monetary decisions was determined by the subjects' response in the following situation:

Ten items, each approximately one dollar in value and high demand items for this age group, were displayed for the subject to examine. The subject was then told that he/she could have the opportunity to "earn" one item from the selection of Snoopy pencils, Eraser-Mate pens, candy, Bubble-Gum, a kite, book, etc. In order to earn the item, the subject was given the following directions:

> You must tell me everything you are thinking as you are making the decision as to the item you want to have for your own. Be sure you describe how you are making your choice. Tell me why you choose the one item you may have for your own. Remember to think out loud. Remember to tell me everything you are thinking. Remember to tell me why you choose the one item you would like to have for your own.

The responses were tape recorded and later scored separately by the above mentioned judges (economists) at the highest level of economic reasoning exhibited. They were unaware of whether the subjects were in the treatment or non-treatment group. Examples of possible responses and scores are as follows:

0 = No recognition of economic reasoning--"I want the candy. I like it."
1 = Recognition of the existence of scarce resources--"I can't have everything--I want the pencils."
2 = Ability to identify specific alternative uses for scarce resources--"I want the pencils, but then I can't have the candy, the jacks, the kite and the book."
3 = Ability to identify those alternative uses that are realistically within one's consideration set, and rank them in terms of anticipated benefits. "I really want the pencils which means I can't have the jacks which I could not only play by myself, but could play with my friends. I will give up the pencils and take the jacks."

Skill in economic reasoning with respect to time-allocation was determined by the subjects' response to the following situation:

> Because of the current energy crisis, President Reagan has determined that after one week, there will be no television for a long time. To get you used to the coming crisis, your parents have stipulated that you may only watch one hour of television a week. You may watch the one hour any day or any time you choose. What would be the program(s) you would choose to watch and why?

Again the responses were tape recorded and later scored by the above mentioned judges as a 0, 1, 2, or 3, based on the highest level of economic reasoning exhibited. Examples of possible responses and scores are as follows:

0 = No recognition or use of economic reasoning--"The Dukes of Hazzard."
1 = Recognition of the existence of scarce resources--" 'The Dukes of Hazzard,' because it lasts for an hour, and I only have one more hour."
2 = Ability to identify alternative uses for scarce resources--"I could watch 'The Incredible Hulk' or 'The Dukes of Hazzard' or 'Trapper John.' Boy, I have a lot of choices."
3 = Ability to identify those alternative uses that are realistically within one's consideration set, and rank them in terms of anticipated benefits--"I could watch 'Little House on the Prairie,' which I like; I also like 'The Incredible Hulk'; but, I think I would choose 'The Dukes of Hazzard' because I like it more. There is a lot of action, and a lot of car chases, and I really like cars."

The interscorer consistency between the two judges had been piloted, using the Pearson product-moment correlatoin coefficient, and the following results were obtained: economic reasoning/monetary .91; and economic reasoning/time allocation .84.

Procedure

Treatment subjects participated in ten weeks of Mini-Society (3 times a week for 50 minutes per session) in the second semester (February through June) of the academic year while non-treatment students concomitantly participated in the schools' "regular social studies program" (3 times a week for 50 minutes per session). In the last two weeks of May, all of the students, both the treatment and non-treatment groups, were tested on:

(1) their understanding of cost-benefit analysis (economic cognition).

(2) their use of economic reasoning (cost-benefit analysis) in personal decision-making with respect to monetary decisions.

(3) their use of economic reasoning (cost-benefit analysis) in personal decision-making with respect to time-allocation decisions.

Each subject was individually interviewed by one of two trained interviewers away from the classroom environment.* The student's responses were tape recorded to ascertain the student's level of economic cognition.

The subjects were first asked the five cognition questions. Then they were shown the ten items and allowed to earn one of these by "thinking out loud." Last, they were given the time-allocation dilemma and asked to respond.

The tapes were then evaluated individually by two scorers--not the interviewers. The data was statistically analyzed with the primary goal of ascertaining determinants of economic cognition and reasoning. A posttest-only control group was utilized. Subjects in this type of design are randomly

*Three independent scorers were utilized to analyze the interview consistency in 20 interviews (10 each) conducted by the two interviewers. They were unable to detect any differences in the interview technique of the interviewers, with the boys and girls, or with treatment and non-treatment subjects.

assigned to two or more groups. The groups then receive their respective treatments and a posttest. Because the posttest-only control group design involves random assignment and a control group, this design constitutes a true experiment and serves to control for all sources of internal invalidity except mortality (Shavelson, 1981; Gay, 1981; Campbell and Stanley, 1963). To compare the means of the different groups a three-way analysis of variance was used (sex by grade by treatment).

RESULTS

With regard to study question 1, the effect of treatment on economic cognition, it appears that instructional intervention--The Mini-Society--is an important determinant of economic cognition at each grade level. Table 1 presents the means both by grade and treatment.

Table I

Thus it appears that children exposed to instructional intervention--The Mini-Society--significantly outperform non-treatment students with respect to demonstrating their knowledge of cost-benefit analysis. In fact, the analysis of variance reveals a significance level of $<.01$ (F_1, 204, = 98.61).

In study question 2, we were interested in ascertaining whether the proclivity to use economic reasoning (cost-benefit analysis) in everyday decision-making was related to treatment. With respect to monetary decisions it was found that treatment was a significant factor ($p<.01$) in economic decision-making (F_1, 204, = 8.02).

Table II

Similar results were obtained for decisions pertaining to time-allocation (F_1, 204, = 8.02). Thus participation in The Mini-Society does appear to result in transfer of economic reasoning to everyday decision-making both with respect to monetary and time-allocation decisions.

We examined in study question 3 whether the understanding of cost-benefit analysis and the transfer of such reasoning to everyday decision-making was age-related. It appears that age is a potent factor in determining economic cognition (F_3, 204, = 10.56) as well as economic reasoning with respect to monetary decisions (F_3, 204, = 4.21). However with respect to time-allocation decisions the findings are inconclusive. Specifically with respect to time-allocation the interaction of grade, treatment, and sex is significant (F_3, 204, = 3.49) and at the control group level there is an interaction

TABLE I

Economic Cognition Score Means
by Grade and Treatment

	Grade 1	Grade 2	Grade 3	Grade 4
Control Group	.41 (n=27)	.69 (n=32)	.73 (n=26)	.90 (n=21)
Treatment Group	1.50 (n=26)	2.26 (n=27)	2.65 (n=29)	3.75 (n=32)

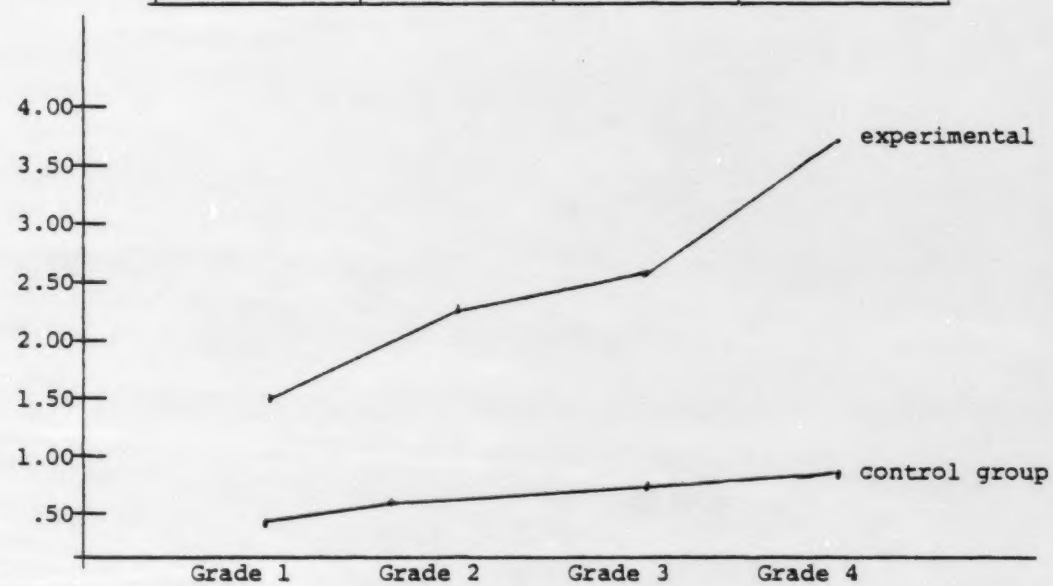

TABLE II

Monetary Decision Score Means

By Grade

Grade 1	1.00 (n=53)
2	1.10 (n=59)
3	1.33 (n=55)
4	1.62 (n=53)

By Sex

Male	1.10 (n=106)
Female	1.40 (n=114)

By Experimental Condition

Control Group	1.01 (n=106)
Experimental Group	1.48 (n=114)

between grade and sex (F_3, 98, = 3.20) which indicates that girls do better at certain grade levels than boys and vice versa.

Table II

In summary, the analysis of variance reveals that in terms of economic cognition the tests for the three specific main effects were significant. As they get older students seem to have a better understanding of cost-benefit analysis (F_3, 204, = 4.21), and overall, girls score higher than boys (F_1, 204, = 4.62). Also the treatment produces a significant effect.

In everyday decision-making with respect to personal monetary decisions, the interaction of grade and treatment and sex is significant. Also, as they get older students appear to have a greater proclivity to utilize cost-benefit analysis, and girls tend to outscore boys.

TABLE III

Time Allocation Score Means
by Grade, Treatment and Sex

	Grade 1	Grade 2	Grade 3	Grade 4
Male (Control)	.69 (n=13)	.39 (n=18)	.36 (n=14)	.77 (n=13)
Female (Control)	.14 (n=14)	.86 (n=14)	.92 (n=12)	.62 (n=8)
Male (Treatment)	.25 (n=8)	.92 (n=13)	.85 (n=13)	1.00 (n=14)
Female (Treatment)	1.00 (n=18)	.78 (n=14)	1.00 (n=16)	1.33 (n=18)

DISCUSSION

With regard to study question 1, the effect of instructional intervention on economic cognition, it was not surprising to find that treatment was an important factor. Almost all previous research has indicated that instructional intervention does result in acquisition of economic concepts. It is however interesting to note that the previous studies also indicate a lack of transference and retention and conclude that the typical instructional intervention leads to a mastery of economic concepts only at the recall level rather than at higher levels of cognition (Craig and O'Neill, 1973; Saunders, 1970 and 1980; Harbury and Szreter, 1970; Sulkin and Pranis, 1969; Moyer and Paden, 1968; Dawson and Bernstein, 1967; Clayton, 1964). However, in this study a verbal test was administered which utilized questions that were all beyond the recall level of the cognitive domain (Bloom, 1956).

Thus the difference between treatment and non-treatment subjects may suggest that the particular intervention, Mini-Society (or similar type mediation), gives students an advantage in mastering concepts beyond the memory level. This advantage (which may or may not be attributed to the Mini-Society itself) may explain why these six to ten year old children could both apply and even transfer these concepts to everyday life decisions (study question 2), whereas children of the same age in other economic education studies could in most cases only regurgitate the economic content.

However it appears that with respect to 6, 7, 8, and 9 year olds the ability to transfer economic reasoning to monetary decisions is greater than to time-allocation decisions. In fact, treatment is much less important as a determinant of economic reasoning with respect to time-allocation than it appears to be with regard to money or even economic cognition itself. In terms of time-allocation, even with instructional intervention, most students at best

were reasoning at Level 1 of the hierarchy. It is possible that in verbalizing about time decisions subjects failed to make their analysis explicit; however it seems no more probable that this would be the case with respect to time decisions than with respect to monetary decisions.

More likely, children fail to perceive a time budgetary constraint analogous to the money budgetary constraint. The budget constraint on money is probably more salient and visible than the constraint on time. However, by the fourth grade children were using higher levels of economic reasoning with respect to time-allocation decisions than college students (Kourilsky and Ward-Keheret, 1983). Such a finding, if replicated, has curricular implications for economists. Given that economic reasoning is an important objective, it may be unwise to wait until college to introduce students to the discipline of economics. Also, in most courses, illustrations of economic principles are almost always in terms of goods, services, or money. We should also utilize examples that include time as a valuable resource. Perhaps eventually it would not take up to the time of mortality for people to realize that "time may be worth more than money."

Our last study question asked whether the understanding and transfer of cost-benefit analysis are age-related. The results clearly indicate that the age of the student is an important factor, especially with regard to economic cognition and economic reasoning (monetary). It is both easy and seductive to interpret these findings to mean that both economic cognition and transfer of such cognition are developmental in the Piagetian sense (Cognitive development, based upon a Piagetian model, results in cumulative changes in information processing and response. These changes are set in general age-related categories, which provide a range within the developmental hierarchy. The four basic stages are: sensorimotor, 0-2; preoperational, 2-7;

concrete operations, 7-11; and formal operations, 11-15).

However, our results simply suggest as a provocative hypothesis that the economic reasoning hierarchy is not only a descriptive and perhaps a normative hierarchy but also a developmental hierarchy. Youngsters at the concrete operations stage are definitely improving their ability both to manifest and invoke knowledge of cost-benefit analysis. At this point it would be premature to conclude that such a finding indicates more than "as children get older they get smarter." However, there is a definite pattern that suggests that the invoking of cost-benefit analysis indeed may be a developmental process. Future research might focus more closely on this issue and determine specific cumulative stages occurring developmentally.

An unanticipated outcome of the study was the pattern of gender-related differences at specific age levels. In general, girls appear to outperform boys in terms of economic cognition and reasoning. Both previous research (Ferber, Birnbaum, and Green, 1983) and our observations suggest that whereas these differences may be statistically significant, they are not necessarily substantively meaningful. Since interview procedures were utilized, it is possible that the girls' inherent verbal fluency tended to allow them to outperform boys. On the other hand, it is also possible that, if exposed to economics early enough, girls may have an advantage over boys in their propensity to understand and apply such concepts.

In sum, we now know that children have definite potential ability to use cost-benefit analysis, which can be accelerated by instructional intervention. The remaining question is whether such reasoning is developmental.

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